This listing of claims will replace all prior versions of claims in the application.

LISTING OF CLAIMS

Claim 1. (original): A microfluidic device comprising:

a card shaped substrate having first and second opposing faces;

one or more microvolumes at least partially defined by a first face of the card shaped substrate; and

one or more grooves at least partially defined by a second face of the card shaped substrate;

wherein a lateral footprint of at least a portion of the one or more grooves overlaps with a lateral footprint of at least one of the one or more microvolumes.

Claim 2. (original): A microfluidic device according to claim 1, wherein the one or more grooves are sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least half as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 3. (original): A microfluidic device according to claim 1, wherein the one or more grooves are sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 4. (original): A microfluidic device according to claim 1, wherein the one or more grooves are sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the

overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least three times as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 5. (original): A microfluidic device according to claim 1, wherein the one or more grooves are sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least five times as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 6. (original): A microfluidic device according to claim 1, wherein the one or more grooves are sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least ten times as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 7. (original): A microfluidic device according to claim 1, wherein the one or more microvolumes comprise at least one lumen.

Claim 8. (original): A microfluidic device according to claim 7, wherein the groove has a longitudinal axis that is aligned with a longitudinal axis of the lumen adjacent the overlapping lateral footprint.

Claim 9. (original): A microfluidic device according to claim 7, wherein the groove has a longitudinal axis that is perpendicular to a longitudinal axis of the lumen adjacent the overlapping lateral footprint.

Claim 10. (original): A microfluidic device according to claim 1, wherein the one or more microvolumes comprise at least one lumen with a cross sectional diameter of less than 2.5 mm.

Claim 11. (original): A microfluidic device according to claim 1, wherein the one or more microvolumes comprise at least one lumen with a cross sectional diameter of less than 1 mm.

Claim 12. (original): A microfluidic device according to claim 1, wherein the one or more microvolumes comprise at least one lumen with a cross sectional diameter of less than 500 microns.

Claim 13. (original): A microfluidic device according to claim 1, wherein the one or more microvolumes comprise at least one microchamber.

Claim 14. (original): A microfluidic device according to claim 1, wherein the substrate comprises a member of the group consisting of polymethylmethacrylate, polycarbonate, polyethylene terepthalate, polystyrene, styrene copolymers, glass, and fused silica.

Claim 15. (original): A microfluidic device according to claim 1, wherein the substrate is optically transparent.

Claim 16. (original): A microfluidic device comprising:

a card shaped substrate having first and second opposing faces;

a plurality of microvolumes at least partially defined by a first face of the card shaped substrate; and

one or more grooves at least partially defined by a second face of the card shaped substrate;

wherein a lateral footprint of at least a portion of the one or more grooves overlaps with lateral footprints of plurality of microvolumes.

Claim 17. (original): A method for use with a microfluidic device, the method comprising:

performing an experiment in a microfluidic device comprising a card shaped substrate having first and second opposing faces, one or more microvolumes at least partially defined by a first face of the card shaped substrate; and one or more grooves at least partially defined by a second face of the card shaped substrate; wherein a lateral footprint of at least a portion of the one or more grooves overlaps with a lateral footprint of at least one of the one or more microvolumes; and

performing a spectroscopic analysis within the overlapping lateral footprint.

Claim 18. (original): A method according to claim 17, wherein the spectroscopic analysis is selected from the group consisting of Raman, UV/VIS, IR, x-ray spectroscopy, polarization, and fluorescent.

Claim 19. (original): A method according to claim 17, wherein the spectroscopic analysis is x-ray spectroscopy.

Claim 20. (original): A method according to claim 19, wherein the x-ray spectroscopy is x-ray diffraction.

Claim 21. (original): A method according to claim 17, wherein the spectroscopic analysis involves an x-ray traversing the microfluidic device.

Claim 22. (original): A method according to claim 21, wherein the groove is sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least half as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 23. (original): A method according to claim 21, wherein the groove is sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint

comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 24. (original): A method according to claim 21, wherein the groove is sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least three times as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 25. (original): A method according to claim 21, wherein the groove is sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least five times as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 26. (original): A method according to claim 21, wherein the groove is sufficiently deep relative to the second face of the substrate within the overlapping lateral footprint that when the portion of the microvolume within the overlapping lateral footprint comprises a crystallization sample and an x-ray beam traverses the card shaped substrate at the overlapping lateral footprint, the portion of the microvolume that the x-ray beam traverses contains at least ten times as many electrons as is contained in the substrate where the x-ray beam traverses.

Claim 27. (original): A method according to claim 17, wherein the experiment is a crystallization.

Claim 28. (original): A method according to claim 17, wherein the experiment is a crystallization of a biomolecule.

Claim 29. (currently amended) A method according to claim 17, wherein the experiment is a crystallization of a molecule ~~at least 500MW~~ with a molecular weight of at least 500 Daltons.

Claim 30. (original):A method according to claim 17, wherein the experiment is a crystallization of a protein.

Claim 31. (original): The method according to claim 17 wherein the material to be crystallized is selected from the group consisting of viruses, proteins, peptides, nucleosides, nucleotides, ribonucleic acids, deoxyribonucleic acids.

Claim 32. (original): The method according to claim 17 wherein the material to be crystallized contains at least two or more materials selected from the group consisting of viruses, proteins, peptides, nucleosides, nucleotides, ribonucleic acids, deoxyribonucleic acids, small molecules, drugs, putative drugs, inorganic compounds, metal salts, organometallic compounds and elements.

Claim 33. (original): A method according to claim 17, wherein the one or more microvolumes comprise at least one lumen with a cross sectional diameter of less than 2.5 mm.

Claim 34. (original): A method according to claim 17, wherein the one or more microvolumes comprise at least one lumen with a cross sectional diameter of less than 1 mm.

Claim 35. (original): A method according to claim 17, wherein the one or more microvolumes comprise at least one lumen with a cross sectional diameter of less than 500 microns.

Claim 36. (original): A method for use with a microfluidic device, the method comprising:

performing an experiment in a microvolume of a microfluidic device; and

performing a spectroscopic analysis using an x-ray beam that traverses the microfluidic device such that material within the microfluidic device that the x-ray beam traverses contains at least as many electrons as is otherwise traversed when the x-ray beam traverses the microfluidic device.

Claim 37. (original): A method according to claim 36, wherein the material within the microfluidic device that the x-ray beam traverses contains at least three times as many electrons as is otherwise traversed when the x-ray beam traverses the microfluidic device.

Claim 38. (original): A method according to claim 36, wherein the material within the microfluidic device that the x-ray beam traverses contains at least five times as many electrons as is otherwise traversed when the x-ray beam traverses the microfluidic device.

Claim 39. (original): A method according to claim 36, wherein the material within the microfluidic device that the x-ray beam traverses contains at least ten times as many electrons as is otherwise traversed when the x-ray beam traverses the microfluidic device.

Claim 40. (original): A method according to claim 36, wherein the experiment is a crystallization.

Claim 41. (original): A method according to claim 36, wherein the experiment is a crystallization of a biomolecule.

Claim 42. (original): A method according to claim 36, wherein the experiment is a crystallization of a protein.

Claim 43. (original): A method according to claim 36, wherein the material to be crystallized is selected from the group consisting of viruses, proteins, peptides, nucleosides, nucleotides, ribonucleic acids, deoxyribonucleic acids.

Claim 44. (original): A method according to claim 36, wherein the material to be crystallized contains at least two or more materials selected from the group consisting of viruses, proteins, peptides, nucleosides, nucleotides, ribonucleic acids, deoxyribonucleic acids, small molecules, drugs, putative drugs, inorganic compounds, metal salts, organometallic compounds and elements.

Claim 45. (original): A method according to claim 36, wherein the microvolume comprises is a lumen.

Claim 46. (original): A method according to claim 36, wherein the microvolume comprises is a lumen with a cross sectional diameter of less than 2.5 mm.

Claim 47. (original): A method according to claim 36, wherein the microvolume comprises is a lumen with a cross sectional diameter of less than 1 mm.

Claim 48. (original): A method according to claim 36, wherein the microvolume comprises is a lumen with a cross sectional diameter of less than 500 microns.

Claim 49. (original): A method according to claim 36, wherein the microfluidic device comprises a card shaped substrate.